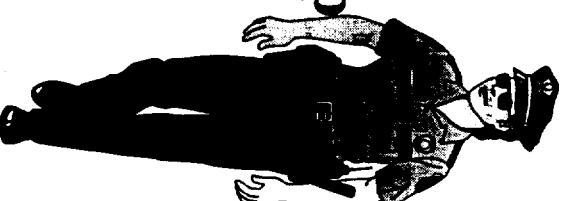
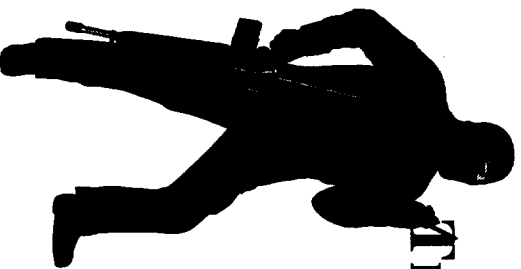


Design for Security HWG

Summary Update

Transport Airplane and Engine Issues Group

Washington D.C.



Mark Allen - Chair

March 27 - 28, 2001

Boeing - Structures

ARAC Members

Mark Allen - Chair
Boeing - Structures

Joel Siqueira
Embraer - Design

Jeff Gardlin
FAA - Cabin Safety &
Airframe

Dave Melberg
Boeing - Flight Deck

Gale Meek
Cessna - Certification

Steve Loukusa
Boeing - ECS

Captain Peter Reiss
IFALPA / ALPA

Ed Kittel
FAA - Explosives

Michael Purwins
EADS Airbus - Certification

Brian Wall
IATA - Security Services

Rory Martin
JAA / CAA - Structures

Keith Ayre
Bombardier - Systems

Maurizio Molinari
Transport Canada

Eric Duvivier
JAA / DGAC

Structures Engineering
Cabin Safety & ECS

General

Working Group Tasked With Eight ICAO Rules:

(And Possibly One FAA Initiated Rule)

- * Flight Deck Smoke Protection
- * Cabin Smoke Extraction
- * Cargo Compartment Fire Suppression
- * Systems Survivability
- * Least Risk Bomb Location (Identification)
- * Least Risk Bomb Location (Design)
- * Design for Interior Search
- * Penetration Resistance
- * *Flight Deck Intrusion* (FAA initiative)



Flight Deck Smoke Protection

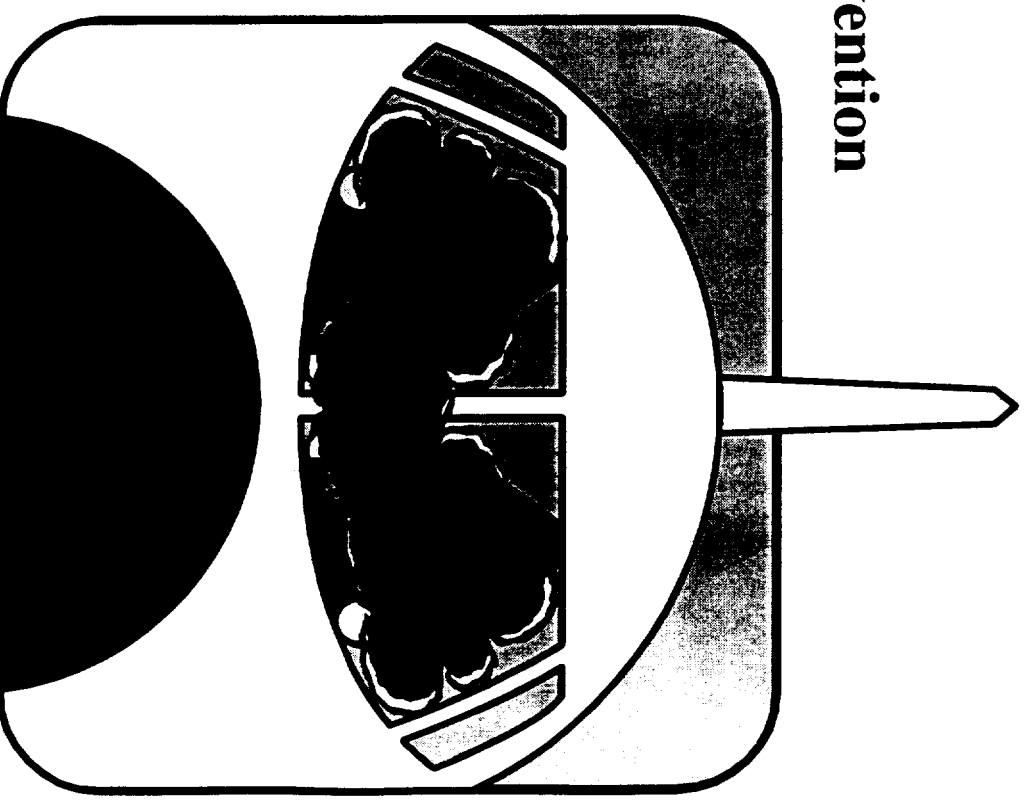
Main Concern is Smoke Entry Prevention

Absolute Sealing is not Viable

- Smoke Particles are too Small
- Difficult to Maintain Seal

Increased Airflow Only Option

- Boost Switch Option
- Noise Levels Increase
- 0.1 psi Delta Pressure High
(230 lb. Door Load)



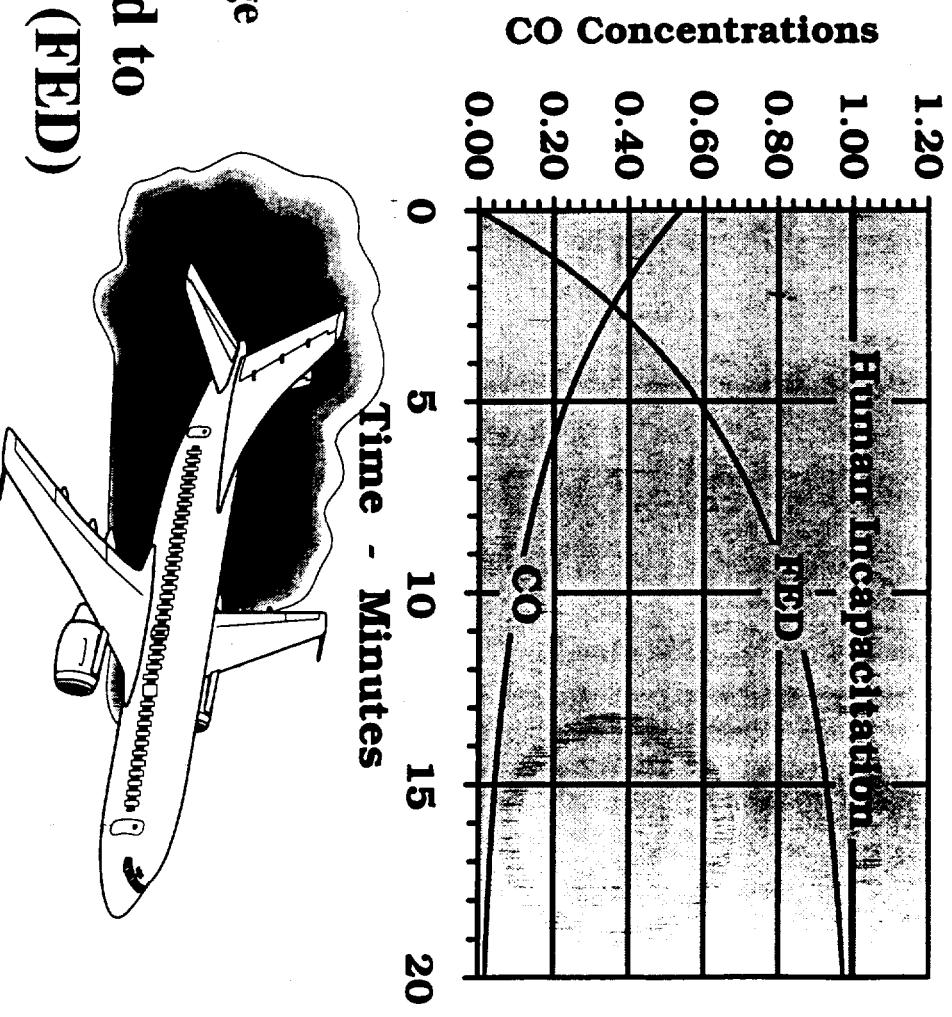
AC 25-9A Requires Revision (Test Demonstration)

Cabin Smoke Extraction

Assumptions

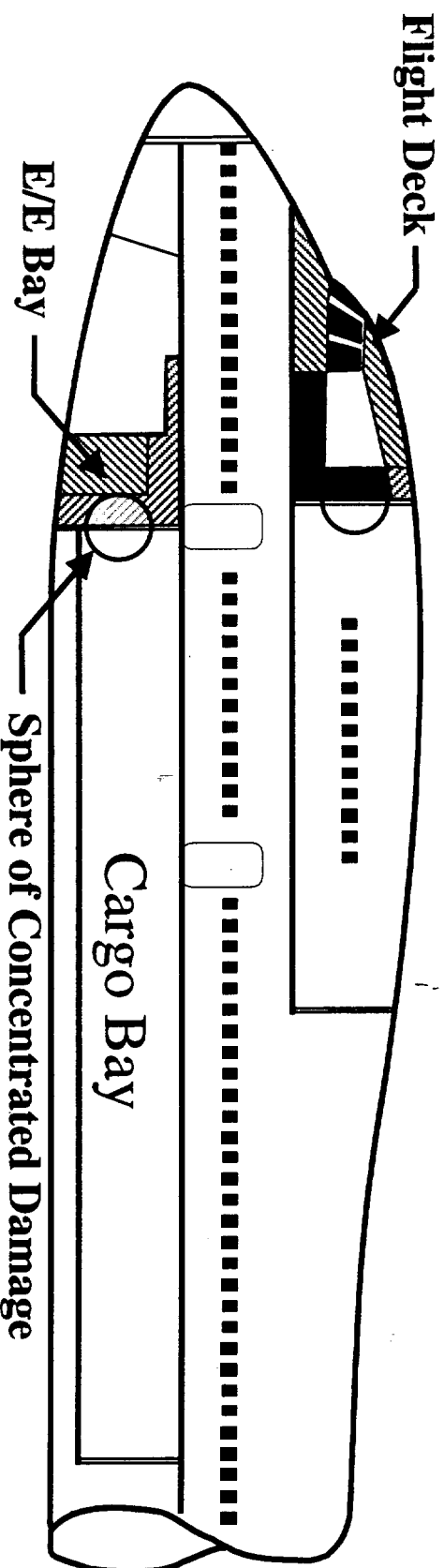
- Fire Contained
- Carbon Monoxide (CO) Highest Toxicity
- Continuous Mixing
- Ventilation Model:
$$C = C_0 e^{-t/\tau}$$
$$\tau = \text{Minutes per Air Change}$$
- Human Tolerance Related to Fractional Effective Dose (FED)

Cabin and Passenger CO Concentrations



Systems Survivability

Rule Will Resemble FAR 25.365(e) - “20 Square-Foot Hole Rule”
Circular Area Converted to a Diameter



Critical Systems Location



Region Requiring Protection

Upper Limit of 20 Square Feet Maintained Flight Critical Systems Only
Fuel Tanks Excluded (Manufacturer Specified)

Cargo Compartment Fire Suppression

Areas of Concern

Action

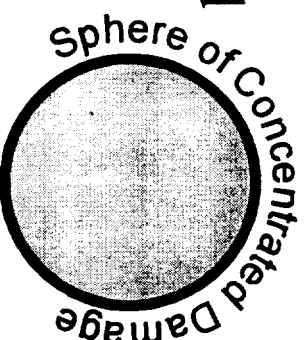
Liner Rupture
(blast overpressure)
Incendiary Devices
(w/ self-contained oxygen)
Failed Detection System
Delivery Bottle Vulnerability
Delivery Line Failure

None - Low Risk
Self-Test & Self Evident
Bottle Separation or Protection
Flexible or Break-Free Attachments

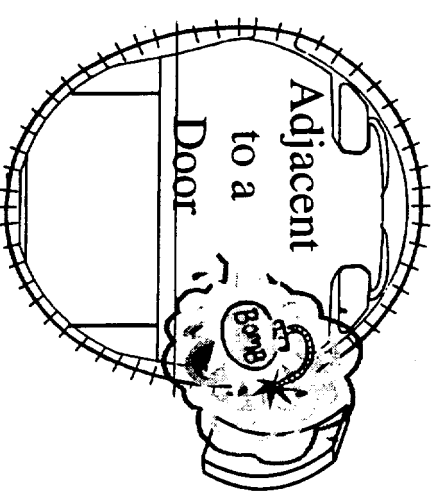
Least Risk Bomb Location

(Design & Identification)

- Threat Never to be Identified
- Threat Size Related to 25.365(e) ???



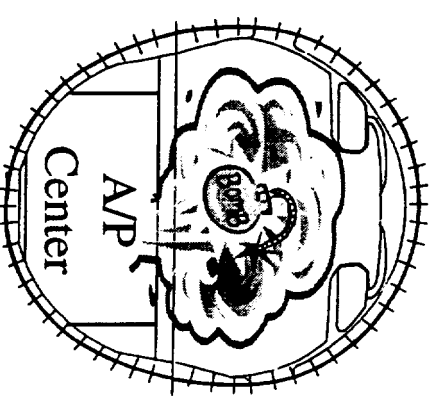
FAA
Preferred
Location



LRBL Procedures

- Manufacturer Creates
- FAA (Manufacturer?) Controls

Proposed
Alternative

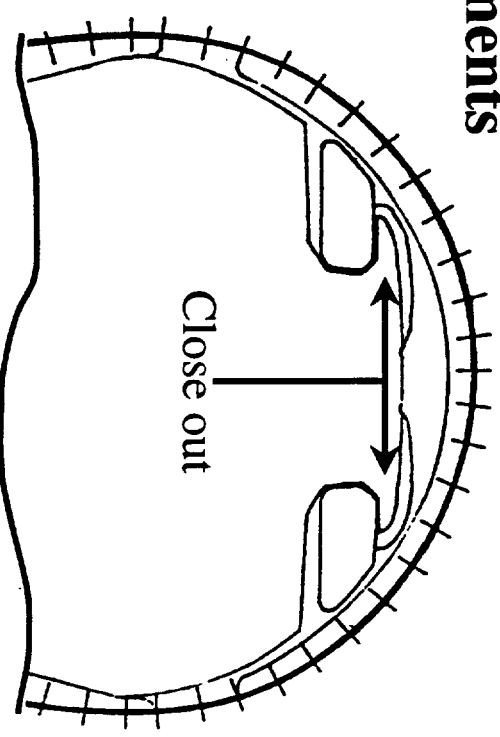
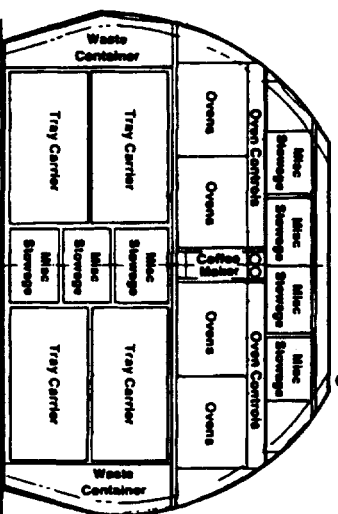


Design for Interior Search

Design for Ease of Inspection and Difficulty for Hiding

- Tamper Proof Life Jackets
- Fasteners Requiring Special Tools
- Avoid Empty Spaces and Loose Fitting Attachments
- Easily Removable / Replaceable Seat Cushions
- Locked Storage Compartments

Lacking Method to Identify Compliance

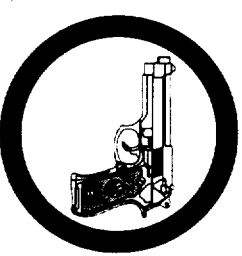
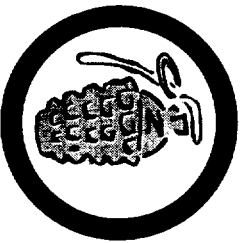


Penetration Resistance

Flight Deck Protection From all Passenger Compartments

Protection Follows NIJ Standard 0101.04

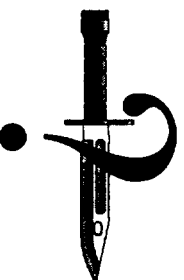
- .44 Magnum & 9mm @ 1400 fps
- Six Shots Each Bullet Type
- 0° and 30° Impact Angles
- No Penetration Allowed



Enhanced Designs (by analyses) Need not be Tested

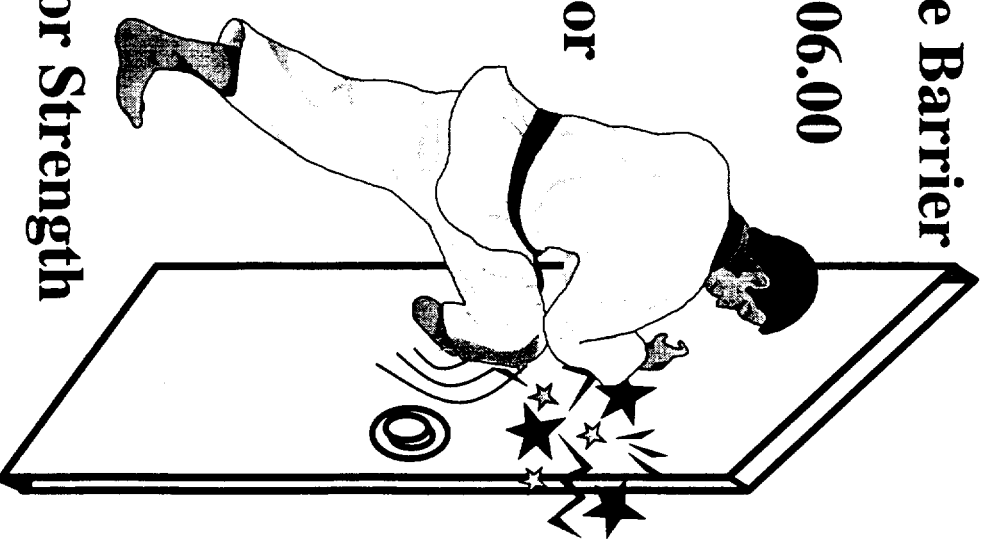


Rule Essentially Complete



Flight Deck Intrusion

- Design for Entry Delay, not Impenetrable Barrier
- Protection Follows NILECJ Standard 0306.00
 - Medium Door Security
 - Based on Historical Break-Ins
 - Two Impacts Each (160 Joules) at Door Center and Latch (Equivalent to 220 lb @ 4 mph)
- Blow-out Panels Permitted
- Pull Test Might be Added
- Unresolved Whether to Demonstrate Door Strength After all Tests or After Each Test



Meeting Schedule

Gatwick, U.K.

23 - 25 Jan 2001

Seattle, Wa.

24 - 26 Apr 2001

Paris, France

24 - 26 July 2001

Washington D.C.

2 - 4 Oct 2001